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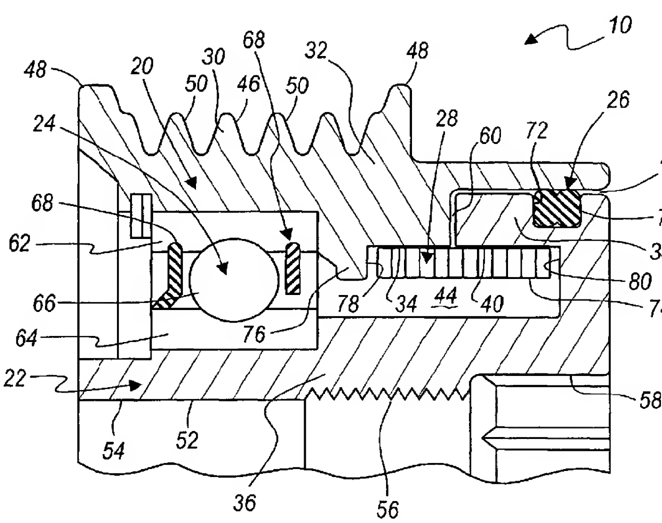
(54) Title: OVER-RUNNING CLUTCH PULLEY WITH CLOSED CLUTCH CAVITY



(57) Abstract: An over-running clutch pulley (10) of the preferred embodiment includes a sheave member (20), a hub member (22) located substantially concentrically within the sheave member, a bearing member (24), a sealing member (26), and a clutch member (28), which cooperate to rotationally engage the drive belt (16) and the cylindrical shaft (18). The sheave member preferably includes a sheave input section (30) adapted to the engage the input device (12), and a sheave clutch section (32) defining a sheave clutch surface (34). Similarly, the hub member preferably includes a hub output section (36) adapted to engage the output device (14), and a hub clutch section (38) defining a hub clutch surface (40). The bearing member preferably positions the sheave member and the hub member such that the sheave member and the hub member define a radial gap (42). The sealing member (26), which is preferably located in the radial gap, preferably sustantially prevents substantial passage or any fluid through the radial gap.

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OVER-RUNNING CLUTCH PULLEY WITH CLOSED CLUTCH CAVITY

TECHNICAL FIELD

This invention relates generally to devices in the over-running clutch field, and more specifically to an improved over-running clutch pulley for use with an accessory device driven by an automotive engine with a belt drive.

BACKGROUND

During the operation of an automotive engine, a drive belt is typically used to power and operate various accessory devices. One of these accessory devices is typically an automotive alternator, which provides electrical power to the automobile. While several arrangements of drive belts are in use, the serpentine arrangement, which drives several accessory devices, is currently most favored. Serpentine arrangements typically include a drive pulley connected to the crankshaft of the engine (the "output device") and a drive belt trained about the drive pulley. The drive belt is also trained about one or more conventional driven pulleys, which are connected to the input shafts of various accessories devices (the "input device").

Most conventional driven pulleys are made from a one-piece design with no over-running capabilities. In other words, the conventional driven pulleys are rigidly mounted to the input shaft and are incapable of allowing relative rotational movement between any section of the driven pulley and the input shaft. As a result of the lack of any over-running capabilities and of the generation of significant inertia by the accessory, relative slippage between the drive belt and the driven pulley may occur if the drive belt suddenly decelerates relative to the input shaft. The relative slippage may cause an audible squeal, which is annoying from an auditory standpoint, and an undue wear on the drive belt, which is undesirable from a mechanical standpoint.

In a typical driving situation, the drive belt may experience many instances of sudden deceleration relative to the input shaft. This situation may occur, for example, during a typical shift from first gear to second gear under wide open throttle acceleration. This situation is worsened if the throttle is closed or "back off" immediately after the shift. In these situations, the drive belt decelerates very quickly while the driven pulley, with the high inertia from the accessory device, maintains a high rotational speed, despite the friction between the drive belt and the driven pulley.

In addition to the instances of sudden deceleration, the drive belt may experiences other situations that cause audible vibration and undue wear. As an example, a serpentine arrangement with conventional driven pulleys may be used with an automobile engine that has an extremely low idle engine speed (which may increase fuel economy). In these situations, the

arrangement typically experiences "belt flap" of the drive belt as the periodic cylinder firing of the automotive engine causes the arrangement to resonate within a natural frequency and cause an audible vibration and an undue wear on the drive belt.

The disadvantage of the conventional driven pulleys, namely the audible squeal, the undue wear, and the vibration of the drive belt, may be avoided by the use of an over-running clutch pulley instead of the conventional driven pulley. An over-running clutch pulley allows the pulley to continue to rotate at the same rotational speed and in a same rotational direction after a sudden deceleration of the drive belt. In a way, the over-running clutch pulley functions like the rear hub of a typical bicycle; the rear hub and rear wheel of a conventional bicycle continue to rotate at the same rotational speed and in the same rotational direction even after a sudden deceleration of the pedals and crankshaft of the bicycle. An example of an over-running clutch pulley is described in U.S. Patent No. 5,598,913 issued to the same assignee of this invention and hereby incorporated in its entirety by this reference.

Since many customers of new automobiles are demanding longer lives, with relatively fewer repairs, for their new automobiles, there is a need in the automotive field, if not in other fields, to create an over-running clutch pulley with increased wear resistance. This invention provides an over-running clutch pulley with a closed clutch cavity, which is intended to increase wear resistance while minimizing the costs and weight.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an over-running clutch pulley of the invention, shown with a drive belt as the input device and a cylindrical shaft as the output device;

FIG. 2 is a partial cross-section view, taken along the line 2-2 of FIG. 1, of the over-running clutch pulley of a first preferred embodiment;

FIG. 3 is a partial cross-section view, similar to FIG. 2, of the over-running clutch pulley of a second preferred embodiment;

FIG. 4 is a partial cross-section view, similar to FIG. 2, of the over-running clutch pulley of a third preferred embodiment;

FIG. 5 is a partial cross-section view, similar to FIG. 2, of the over-running clutch pulley of a fourth preferred embodiment; and

FIG. 6 is a partial cross-section view, similar to FIG. 2, of the over-running clutch pulley of a fifth preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description of five preferred embodiments of the invention is not intended to limit the scope of this invention to these preferred embodiments, but rather to enable any person skilled in the art of over-running clutches to make and use this invention.

As shown in FIG. 1, the invention includes an over-running clutch pulley 10 for rotationally engaging an input device 12 and an output device 14. The over-running clutch pulley 10 has been designed for use with a drive belt 16 as the input device 12, and with a cylindrical shaft 18 as the output device 14. More specifically, the over-running clutch pulley 10 has been particularly designed for use with a drive belt 16 with a grooved surface and a cylindrical shaft 18 of an automotive alternator. The over-running clutch pulley 10 may be used, however, in other environments, with other suitable input devices, such as smooth belt, a toothed belt, a V-shaped belt, or even a toothed gear, and with other suitable output devices, such as a polygonal shaft. Furthermore, the over-running clutch pulley 10 may be used in an environment with two devices that alternate their rotational input responsibilities, and in an environment with an "output device" that actually provides rotational input and with an "input device" that actually receives rotational input. In these alternative embodiments, the terms "input device" and "output device" are interchangeable.

As shown in FIG. 2, the over-running clutch pulley 10 of the preferred embodiment includes a sheave member 20, a hub member 22 located substantially concentrically within the sheave member 20, a bearing member 24, a sealing member 26, and a clutch member 28, which cooperate to rotationally engage the drive belt and the cylindrical shaft. The sheave member 20 preferably includes a sheave input section 30 adapted to the engage the input device, and a sheave clutch section 32 defining a sheave clutch surface 34. Similarly, the hub member 22 preferably includes a hub output section 36 adapted to engage the output device, and a hub clutch section 38 defining a hub clutch surface 40. The bearing member 24 preferably positions the sheave member 20 and the hub member 22 such that the sheave member 20 and the hub member 22 define a radial gap 42. The sealing member 26, which is preferably located in the radial gap 42, preferably substantially prevents substantial passage of any fluid through the radial gap 42. In this manner, the bearing member 24, the sheave member 20, the sealing member 26, and the hub member 22 cooperate to define a closed clutch cavity 44 that increases wear resistance of the over-running clutch pulley 10 while minimizing cost and weight.

The sheave input section 30 of the sheave member 20 of the preferred embodiment functions to engage the drive belt. To substantially prevent rotational and axial slippage of the sheave member 20 and the drive belt, the sheave input section 30 preferably defines a sheave input surface 46 with two sheave input shoulders 48 and at least one sheave input groove 50. The sheave input section 30 may alternatively define other suitable surfaces, such as toothed

surfaces or ribbed surfaces, to engage the input device. The sheave input surface 46 is preferably outwardly directed (away from the rotational axis of the over-running clutch pulley 10) and is preferably substantially cylindrically shaped. The sheave input section 30 is preferably made from conventional structural materials, such as steel, and with conventional methods, but may alternatively be made from other suitable materials (as described below) and from other suitable methods.

The hub output section 36 of the hub member 22 of the preferred embodiment functions to engage the cylindrical shaft. The hub output section 36 preferably defines a hub output surface 52 with a smooth section 54 (which functions to ease and center the assembly of the over-running clutch pulley 10 onto the cylindrical shaft), a threaded section 56 (which functions to substantially prevent rotation and to axially retain the hub member 22 to the cylindrical shaft), and a hexagonal section 58 (which functions to mate with an allen wrench for easy tightening and loosening of the over-running clutch pulley 10 onto and off of the cylindrical shaft). Of course, the hub output section 36 may include other suitable devices or define other surfaces to prevent rotational and axial slippage, to engage the cylindrical shaft, and to engage a tool for tightening or loosening the over-running clutch pulley 10 onto and off of the cylindrical shaft. The hub output surface 52 is preferably inwardly directed (toward the rotational axis of the over-running clutch pulley 10) and is preferably substantially cylindrically shaped. The hub output section 36 is preferably made from conventional structural materials, such as steel, and with conventional methods, but may alternatively be made from other suitable materials (as described below) and from other suitable methods.

The sheave clutch section 32 and the hub clutch section 38 of the preferred embodiment function to provide the sheave clutch surface 34 and the hub clutch surface 40, respectively, for the engagement with the clutch member 28. The sheave clutch section 32 preferably extends radially inward from the sheave member 20. In this manner, the sheave clutch section 32 is preferably made from the same material and with the same methods as the sheave input section 30, but may alternatively be made from other suitable materials and with other suitable methods. The hub clutch section 38 preferably extends radially outward from and axially over the hub output section 36. In this manner, the hub clutch section 38 is preferably made from the same material and with the same methods as the hub output section 36, but may alternatively be made from other suitable materials and with other suitable methods.

In the preferred embodiment, the sheave clutch surface 34 and the hub clutch surface 40 are located substantially adjacent with an axial gap 60 between each other. The sheave clutch surface 34 and the hub clutch surface 40 are preferably inwardly directed (toward the rotational axis of the over-running clutch pulley 10) and are preferably substantially cylindrically shaped. Furthermore, the sheave clutch surface 34 and the hub clutch surface 40 preferably

have a similar radial diameter, a similar axial length, and a similar smooth finish. These features allow optimum performance of the clutch member 28. The sheave clutch surface 34 and the hub clutch surface 40 may alternatively have differences with each other on these, or other, design specifications.

In addition to positioning the sheave member 20 and the hub member 22 such that the sheave member 20 and the hub member 22 define the radial gap 42 and the axial gap 60, the bearing member 24 also functions to allow relative rotational movement of the sheave member 20 and the hub member 22. The bearing member 24, which is preferably a rolling element type, preferably includes an outer race element 62 preferably press-fit mounted on the sheave member 20, an inner race element 64 preferably press-fit mounted on the hub member 22, ball bearing elements 66 preferably located between the outer race element 62 and the inner race element 64, and bearing seals 68 preferably extending between the outer race element 62 and the inner race element 64 on either side of the ball bearing elements 66. As discussed below, the bearing member 24 may alternatively omit the bearing seal 68 facing the clutch member 28 if the over-running clutch pulley 10 uses a grease material compatible with the bearing member 24 and the clutch member 28. The bearing member 24 may alternatively be of other suitable types, such as a journal bearing or a roller bearing, may alternatively include other suitable elements, such as a so-called "slinger" shield 69 to prevent direct impingement of water or contaminants, and may alternatively be mounted in other suitable manners. The bearing member 24 is a conventional device and, as such, is preferably made from conventional materials and with conventional methods, but may alternatively be made from other suitable materials and with other suitable methods.

In the preferred embodiment, the axial gap 60 and the radial gap 42 are interconnected, which function to substantially prevent contact between the sheave member 20 and the hub member 22. The sealing member 26, which is preferably located within the radial gap 42, preferably functions to substantially prevent passage through the radial gap 42 of any fluid, namely a grease material (not shown) located in the closed clutch cavity 44 and subjected to centrifugal forces during the operation of the over-running clutch pulley 10. The sealing member 26 also functions to allow relative rotational movement of the sheave member 20 and the hub member 22. Preferably, the sealing member 26 is a four-lobed O-ring 70 made from a conventional material and with conventional methods. Alternatively, the sealing member 26 is any suitable device made from any suitable material and with any suitable method that substantially prevents leakage of a fluid from the closed clutch cavity 44 while simultaneously allowing relative rotational movement of the sheave member 20 and the hub member 22. In the preferred embodiment, the hub clutch section 38 defines a hub outboard cavity 72 that functions to substantially contain the sealing member 26. Because of the nature of the hub outboard

cavity 72, centrifugal forces on the sealing member 26 tend to further increase the ability of the sealing member 26 to substantially prevent passage of any fluid through the radial gap 42. In alternative embodiments, both the sheave member 20 and the hub member 22 may define portions of a gland that functions to substantially contain the sealing member 26.

The clutch member 28 of the preferred embodiment functions to engage the sheave clutch surface 34 and the hub clutch surface 40 upon the acceleration of the sheave member 20 in a first rotational direction relative to the hub member 22, and to disengage the sheave clutch surface 34 and the hub clutch surface 40 upon the deceleration of the sheave member 20 in the first rotational direction relative to the hub member 22. In the preferred embodiment, the clutch member 28 is a coil spring 74. The coil spring 74, which is made from conventional materials and with conventional methods, accomplishes the above features by the particular size and orientation of the coil spring 74 within the closed clutch cavity 44. In alternative embodiments, the clutch member 28 may include other suitable devices that accomplish the above features.

The coil spring 74 is preferably designed with a relaxed spring radial diameter that is sized slightly greater than an inner diameter of the sheave clutch surface 34 and the hub clutch surface 40. Thus, when inserted into the closed clutch cavity 44 and when experiencing no rotational movement of the sheave member 20 or the hub member 22, the coil spring 74 frictionally engages with and exerts an outward force on both the sheave clutch surface 34 and the hub clutch surface 40. Further, the coil spring 74 is preferably oriented within the closed clutch cavity 44 such that the coils extend axially in the first rotational direction from the sheave clutch surface 34 to the hub clutch surface 40. With this orientation, relative rotational movement of the sheave member 20 and the hub member 22 will result in an unwinding or winding of the clutch member 28. In other words, acceleration of the sheave member 20 in the first rotational direction relative to the hub member 22 will bias an unwinding of the coil spring 74 and deceleration of the sheave member 20 in the first rotational direction relative to the hub member 22 will bias a winding of the coil spring 74.

The unwinding of the coil spring 74 tends to increase the outward force of the coil spring 74 on the sheave clutch surface 34 and the hub clutch surface 40, thereby providing engagement, or "lock", of the sheave member 20 and the hub member 22. This engagement condition preferably occurs upon the acceleration of the sheave member 20 in the first rotational direction relative to the hub member 22. On the other hand, the winding of the coil spring 74 tends to decrease the outward force of the coil spring 74 on the sheave clutch surface 34 and the hub clutch surface 40, thereby allowing disengagement, or "slip", of the sheave member 20 and the hub member 22. This disengagement condition preferably occurs upon the deceleration of the sheave member 20 in the first rotational direction relative to the hub member 22.

During the "slip" condition of the over-running clutch pulley 10, the coil spring 74 will lightly rub across the sheave clutch surface 34 or the hub clutch surface 40, which may cause wear of these surfaces. Similarly, during the "lock" condition of the over-running clutch pulley 10, the coil spring 74 will forcefully engage with the sheave clutch surface 34 and the hub clutch surface 40, which may also cause wear of these surfaces. To resist the wear of these surfaces, the sheave clutch surface 34 and the hub clutch surface 40 are preferably formed or treated to have a sufficient surface hardness value.

In the preferred embodiment, the sheave member 20 includes a sheave collar section 76 defining a sheave collar surface 78, and the hub clutch section 38 defines a hub flange surface 80. The sheave collar section 76 preferably extends radially inward from the sheave input section 30 and adjacent the sheave clutch section 32. In the first preferred embodiment, the sheave collar section 76 preferably extends partially into the closed clutch cavity 44. In this embodiment, the inboard seal 68 preferably prevents the passage of debris and impurities between the grease material (not shown) for the bearing member 24 and the grease material (not shown) for the clutch member 28. In the second preferred embodiment, as shown in FIG. 3, the sheave collar section 76' preferably substantially abuts the hub output section 36 and preferably prevents the passage of debris and impurities between the grease material (not shown) for the bearing member 24 and the grease material (not shown) for the clutch member 28, which allows for the absence of the inboard bearing seal (appropriately not shown).

As shown in FIG.s 2 and 3, the sheave collar surface 78 and the hub flange surface 80 are preferably located on opposite ends of the clutch member 28. In this manner, the sheave collar surface 78 and the hub flange surface 80 cooperate to insure the proper placement of the clutch member 28 within the closed clutch cavity 44. The over-running clutch pulley 10 may, of course, use other suitable devices to insure the proper placement of the clutch member 28 within the closed clutch cavity 44. These devices may be surfaces defined by other sections of the sheave member 20 or the hub member 22, or surfaces defined by other suitable elements.

In the first and second preferred embodiments, the sheave collar section 76 and 76' is integrally formed with the sheave input section 30. In this manner, the sheave clutch section 32 is preferably made from the same material and with the same methods as the sheave input section 30. The sheave collar section 76", however, may be separately formed and later connected to the sheave input section 30, as shown in FIG. 4. In this manner, the sheave collar section 76" is preferably provided as a conventional washer 82 made from conventional materials and with conventional methods, but may alternatively be provided as any suitable device made from any suitable material and with any suitable method.

As shown in FIG. 2, the coil spring 74 is preferably positioned over the axial gap 60. Because the coil spring 74 includes several individual spring coils that could enter the axial gap 60 and could possibly jam the over-running clutch pulley 10 or cause undue wear at the edges of the sheave clutch surface 34 and the hub clutch surface 40, the axial gap 60 is preferably less than 0.75 of a spring coil thickness of an individual spring coil. Further, because the contact between the sheave member 20 and the hub member 22 could cause undue wear, the axial gap 60 is preferably greater than 0.25 of the spring coil thickness to allow for normal flexing and dimensional variations of the over-running clutch pulley 10. The axial gap 60, of course, may be greater than 0.75 or less than 0.25 of the spring coil thickness if other suitable devices or methods are used to substantially prevent undue wear caused by contact between the sheave member 20 and the hub member 22 and to substantially prevent jams and wear caused by an individual spring coil into the axial gap 60.

As shown in FIG. 5, the sheave input section 30 in the fourth preferred embodiment defines a sheave inboard gland 84 adapted to substantially collect and contain fluid from the axial gap 60. The fluid, namely the grease material (not shown) for the clutch member 28, may be contaminated with debris particles created from wear between the clutch member 28 and sheave clutch surface 34 and the hub clutch surface 40. Since the debris particles are typically heavier than the grease material, providing the sheave inboard gland 84 allows centrifugal forces on the over-running clutch pulley 10 to pull the debris particles away from the clutch member 28, thereby reducing undue wear of the clutch member 28, the sheave clutch surface 34, and the hub clutch surface 40. As shown in FIG. 6, the hub clutch section 38' in the fifth preferred embodiment defines a hub inboard gland 86, which functions like the sheave outboard gland of the fourth preferred embodiment.

As any person skilled in the art of over-running clutches will recognize from the previous detailed description and from the figures and claims, modifications and changes can be made to the preferred embodiments of the invention without departing from the scope of this invention defined in the following claims.

CLAIMS

We Claim:

1. An over-running clutch pulley for rotationally engaging an input device and an output device, comprising:

a sheave member including a sheave input section adapted to engage the input device, and a sheave clutch section extending radially inward from said sheave input section and defining a sheave clutch surface;

a hub member located substantially concentrically within said sheave member and including a hub output section adapted to engage the output device, and a hub clutch section extending radially outward from and axially over said hub output section and defining a hub clutch surface substantially adjacent said sheave clutch surface;

a bearing member located between said sheave member and said hub member and adapted to allow relative rotational movement of said sheave member and said hub member and to position said sheave member and said hub member such that said sheave member and said hub member define a radial gap;

a sealing member located between said sheave member and said hub member in said radial gap and adapted to substantially prevent passage of any fluid through said radial gap, wherein said bearing member, said sheave member, said sealing member, and said hub member cooperate to substantially define a closed clutch cavity; and

a clutch member located within said closed clutch cavity and adapted to engage said sheave clutch surface and said hub clutch surface upon the acceleration of said sheave member in a first rotational direction relative said hub member, and to disengage said sheave clutch surface and said hub clutch surface upon the deceleration of said sheave member in the first rotational direction relative said hub member.

2. The over-running clutch pulley of Claim 1 wherein said sheave input section defines a sheave input surface with two sheave shoulders and at least one sheave input groove that cooperate to engage a grooved belt as the input device and to substantially prevent rotational and axial slippage between said sheave input surface and the grooved belt.

3. The over-running clutch pulley of Claim 1 wherein said sheave clutch surface is inwardly directed and substantially cylindrically shaped.

4. The over-running clutch pulley of Claim 1 wherein said sheave member further includes a sheave collar section extending radially inward from said sheave input section and adjacent said sheave clutch section and adapted to insure the proper placement of said clutch member within said closed clutch cavity.

5. The over-running clutch pulley of Claim 4 wherein said sheave collar section substantially abuts said hub output section.

6. The over-running clutch pulley of Claim 5 wherein said sheave collar section is integrally formed with said sheave input section.

7. The over-running clutch pulley of Claim 5 wherein said sheave collar section is separately connected to said sheave input section.

8. The over-running clutch pulley of Claim 1 wherein said hub clutch section defines a hub outboard cavity adapted to substantially contain said sealing member.

9. The over-running clutch pulley of Claim 1 wherein said sheave clutch surface and said hub clutch surface define an axial gap to substantially prevent contact between said sheave member and said hub member.

10. The over-running clutch pulley of Claim 9 wherein said axial gap and said radial gap are interconnected.

11. The over-running clutch pulley of Claim 9 wherein said sheave input section defines a sheave inboard gland adapted to substantially collect and contain fluid from said axial gap.

12. The over-running clutch pulley of Claim 9 wherein said hub clutch section defines a hub outboard cavity adapted to substantially collect and contain fluid from said axial gap.

13. The over-running clutch pulley of Claim 9 wherein said clutch member is positioned substantially over said axial gap, wherein said clutch member includes several coils, wherein said coils have a spring coil thickness, wherein said axial gap is greater than 0.25 of said spring coil thickness, and wherein said axial gap is less than 0.75 of said spring coil thickness.

14. The over-running clutch pulley of Claim 1 wherein said hub output section defines a hub output surface adapted to engage a cylindrical shaft as the output device.

15. The over-running clutch pulley of Claim 1 wherein said hub clutch surface is inwardly directed and substantially cylindrically shaped.

16. The over-running clutch pulley of Claim 1 wherein said sealing member is a four-lobed O-ring.

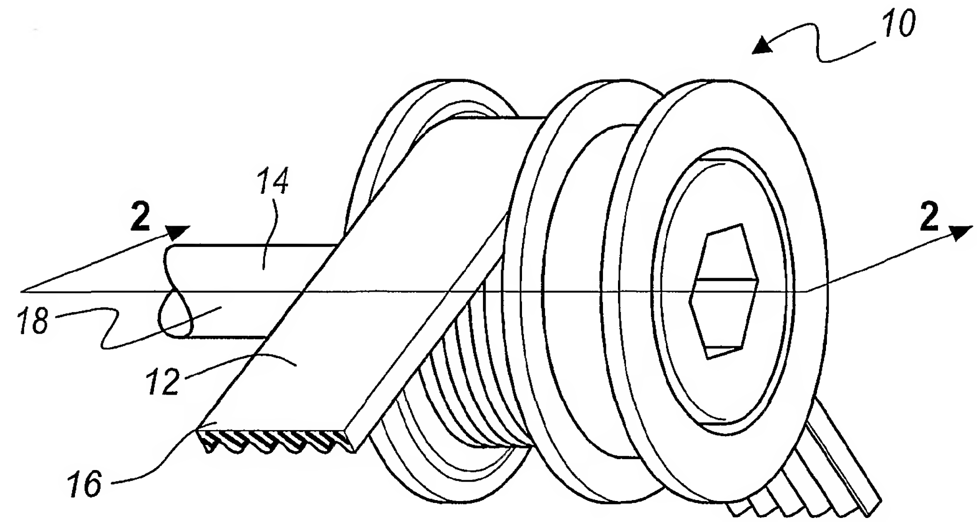
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FIG. - 1

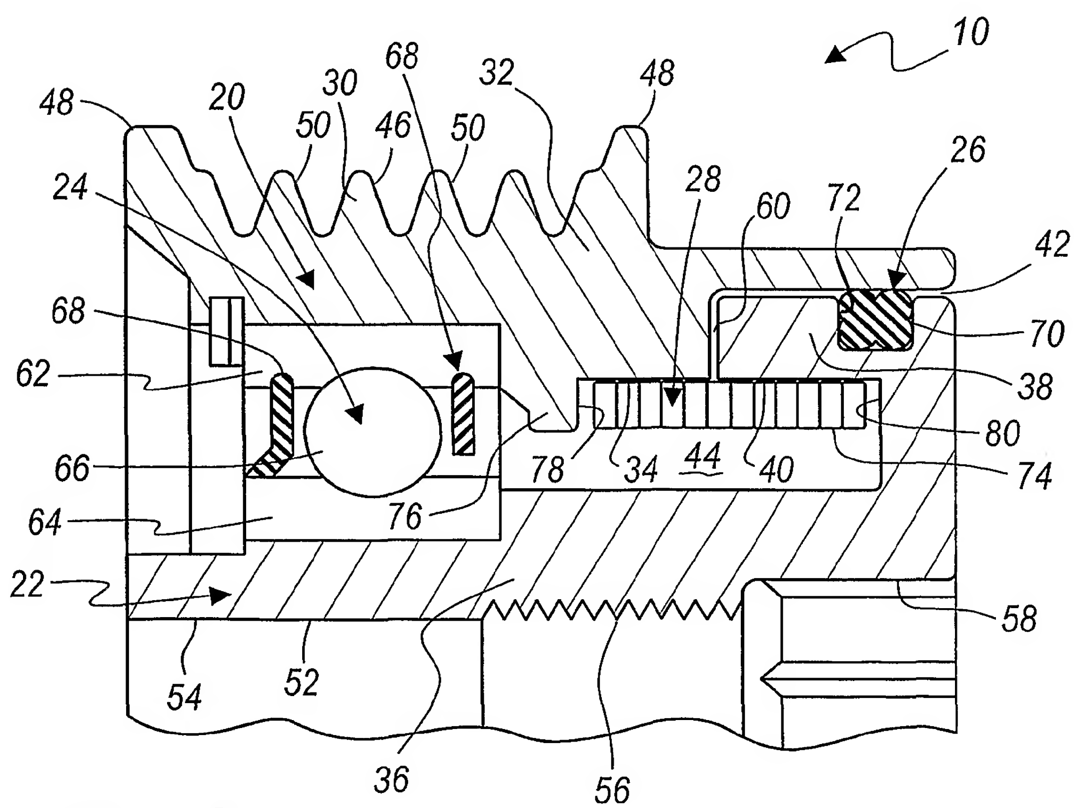
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FIG. - 2

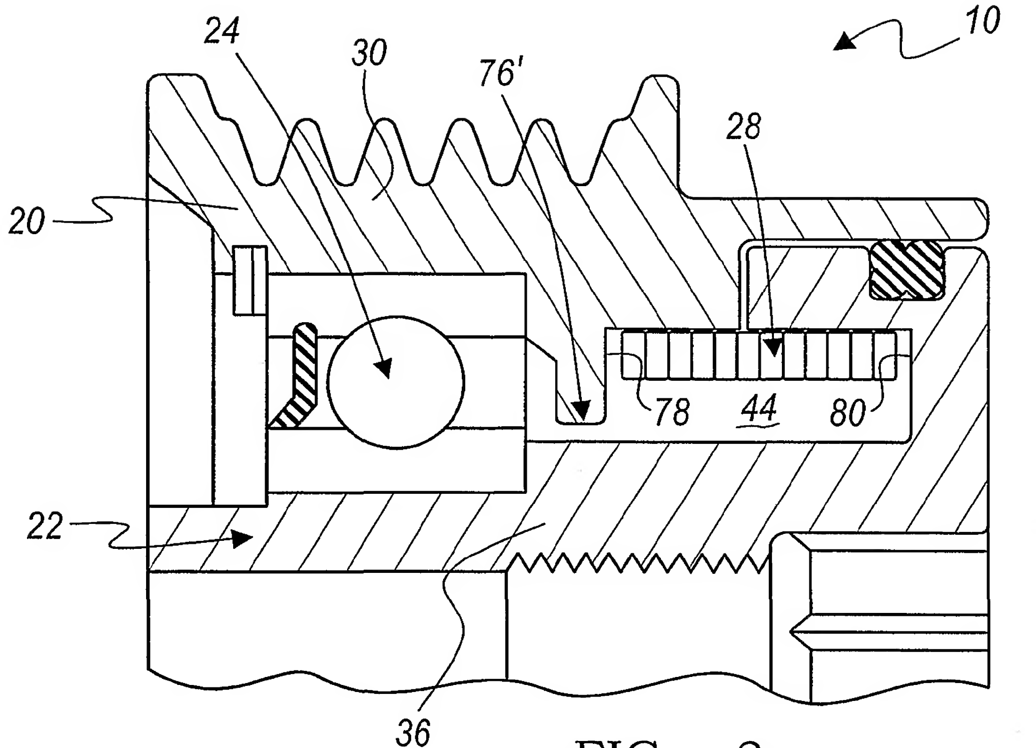

FIG. - 3

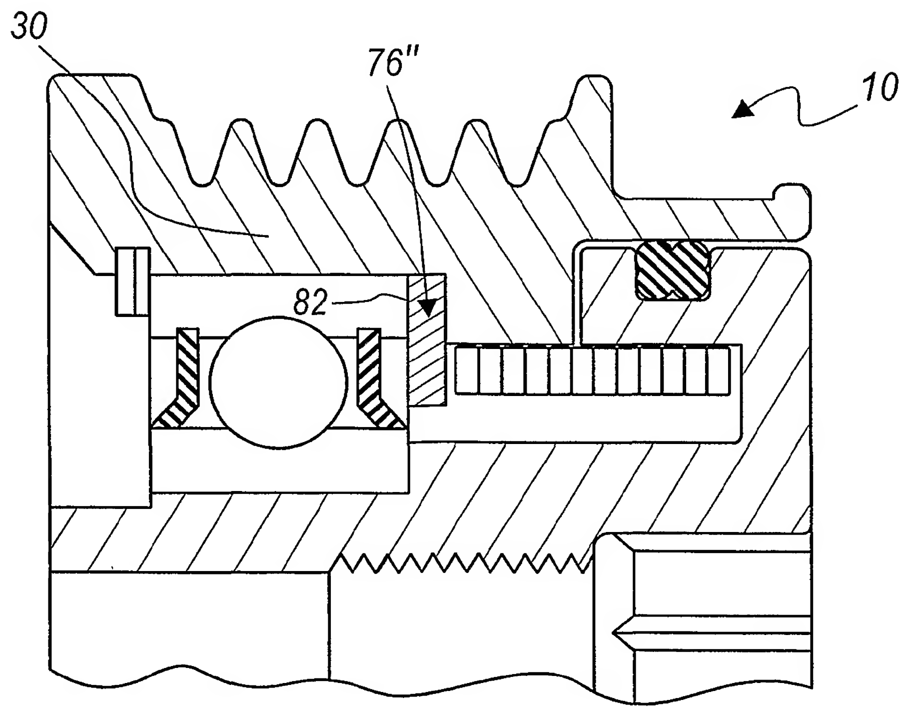

FIG. - 4

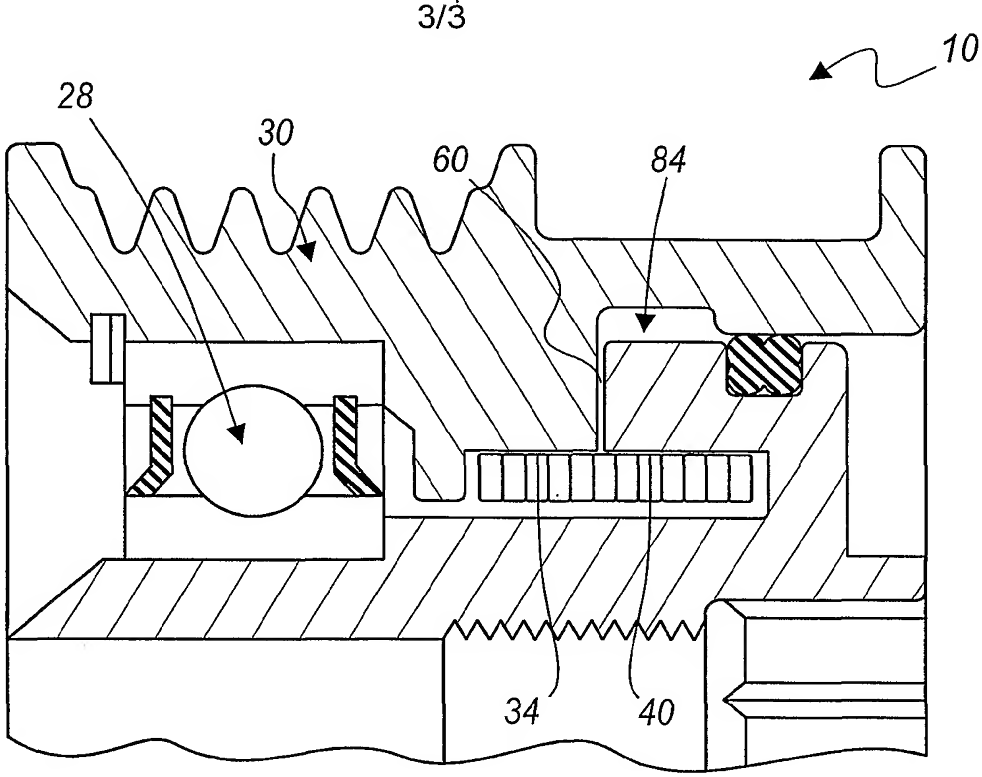

FIG. - 5

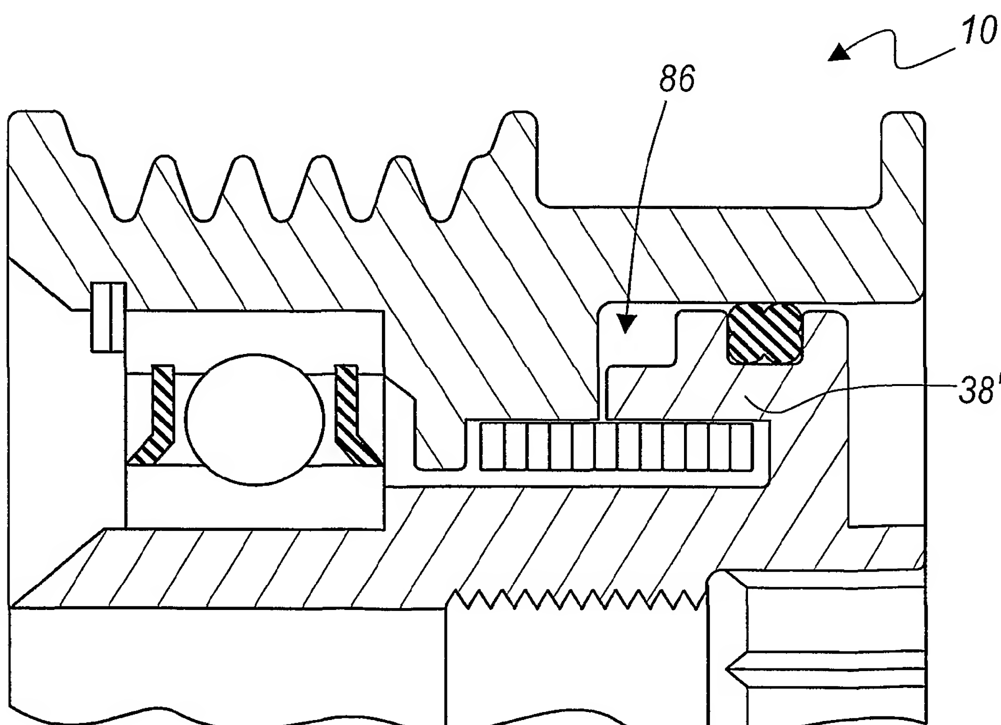

FIG. - 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/17640

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) :F16D 41/20; F16J 15/16, 15/32
US CL : 192/41R; 474/171; 277/402
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 192/41R, 41S; 474/74, 171; 277/402, 530

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 5,517,957 A (WAGNER et al.) 21 May 1996 (21.05.96), see column 4, line 49, to column 6, line 35.	1-8, 14 ---------- 9-13, 15, 16
Y	US 5,598,913 A (MONAHAN et al.) 04 February 1997 (04.02.97), see column 5, line 32, to column 9, line 8.	9-13, 15
Y	US 3,047,300 A (TAYLOR et al.) 31 July 1962 (31.07.62), see column 3, line 9, to column 5, line 34.	16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier document published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search 12 SEPTEMBER 2001	Date of mailing of the international search report 11 OCT 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer RODNEY H. BONCK Diane Smith for Telephone No. (703) 308-2904

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/17640

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

EAST
search terms: ((((("over-running" or (over adj running) or overrunning or "one-way" or way) adj clutch) and (sheave or pulley) and hub) and bearing) and seal